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Twelve Hour Cyclic Operating/Non-Operating Procedure for Distance Accumulation: Motorcycle

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12 Hour Cycle Operating/Non-operative Procedure for Distance Accumulation

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The purpose of the distance accumulation and associated durability vehicle is to assess the aging or deterioration characteristics of the mechanical systems which influence the vehicle emissions. The rationale for proposing the 12 hour soak requirement following each 12 hour increment of motorcycle distance accumulation is presented. This procedure for motorcycles deviates from the light duty procedure which allows continuous operation. It is considered that the motorcycle procedure provides a more realistic simulation of the motorcycle deterioration process without additional cost or time over the LDV procedure due to the substantially shorter distance accumulation required of motorcycles.

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Abstract

The rationale for proposing the 12 hour mode requirement following each 12 hour increment of motorcycle distance accumulation is presented. This procedure for motorcycles deviates from the light duty vehicle procedure which allows continuous operation; it is considered that the motorcycle procedure provides a more realistic simulation of the motorcycle deterioration process without additional cost or time over the LDV procedure due to the substantially shorter distance accumulation required of motorcycles.

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The purpose of the distance accumulation and associated durability vehicle is to assess the aging or deterioration characteristics of the mechanical systems which influence the vehicle emissions. There are numerous factors which are expected to influence deterioration characteristics of a particular design. The total operational period is certainly a major factor. As well, cyclic operation and environmental exposures such as temperature extremes, thermal shock, vibrational stresses, impact loadings, precipitation, corrosive atmospheres, time, etc. are also important factors influencing deterioration of mechanical systems. Clearly, subjecting each prototype motorcycle to a representative exposure of all factors impacting deterioration would be economically prohibitive and infeasible in a reasonable period of time.

Therefore, with consideration of time, economics and potential effect on deterioration, those factors which are impractical to simulate should be eliminated. With motorcycle lifetimes of 5 to 7 years, the element of time is not a reasonable stress to fully impose. Representative requirements for temperature, precipitation, thermal shock, vibration, impact loading and corrosive atmosphere stresses would be difficult to specify, expensive to simulate and of uncertain impact on deterioration. Thus, the deterioration program should be reduced to require the vehicles to be operated over a specified distance under reasonably normal environmental and operational conditions. It is recognized that the environmental exposure will vary considerably depending on the location of distance accumulation and time of year. However, modification of this exposure should be minimized. Operational conditions should be based on a driving schedule representative of overall operation. This driving schedule should provide for cyclic driving operations and total distance. To provide simulation of overnight cool down and some reasonable number of cold starts, the distance accumulation should include cold soak periods. Soak periods of 12 hours are recommended as being reasonable and are consistent with the soak period required for cold start emission testing. Further, such soak periods should be required sequentially with operational periods of not greater than 12 hours. This appears to be a reasonable compromise of simulating representative use to allow rapid assessment of deterioration.

This procedure of requiring 12 hour soak periods during distance accumulation is a departure from the distance accumulation procedure for light duty vehicles (LDVs). This further compromise in the case of LDVs is accepted to allow the implementation of the certification process within a reasonable length of time. To accumulate the 50,000 miles necessary for LDV durability vehicles in the certification process, the vehicles are frequently driven continuously except for maintenance and test periods.

However, in the case of motorcycles, this compromise need not be made. The maximum durability distance for large motorcycles is 30,000 km or 18,641 miles which is approximately one third of the LDV

distance. Since maintenance and other down time needs may be performed during the wash period, the rate of motorcycle distance accumulation (e.g., miles per week) is estimated to be slightly more than one half the LDV rate. Accounting for this rate and the one third total distance requirement, the time period for total motorcycle distance accumulation remains below the period required for LDV's.

The benefit of this 12 hour on/off procedure is an improved simulation of the deterioration process. Therefore, it is recommended the Motorcycle Emission Regulations state the following:

> "Distance accumulation for emission data and durability data vehicles shall be conducted in increments of time, the sum of which shall not exceed a total of 12 hours of operation. A non-operating soak period of not less than 12 hours is required following each 12 hour total operating sequence. Engine shut downs are allowed while accumulating the 12 hour total operating sequence. Shut downs occurring before the accumulation of a 12 hour total operating sequence which exceeds 12 hours may be considered as non-operating soak periods, and the next operating sequence may continue for 12 hours. During the non-operating soak period, the vehicle shall be exposed to normal outside ambient temperature and humidity conditions unless vehicle maintenance or servicing is being performed."